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The complex relationship between emotions, approaches to learning, study success and study progress during the transition to university

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Introduction

The first year of studying at university is likely to have an impact on the future success and development of students, and therefore the transition to higher education is a crucial phase in their lives (e.g., Gale and Parker 2014; Hultberg, Plos, Hendry and Kiellgren 2008; Leese 2010; Tinto 1997). However, most students experience this transition as challenging (McMillan 2014; Scalon, Rowling and Weber 2007), not least because first-year students need to adjust to a new learning environment that demands more independent and effective approaches to academic work (Christie, Barron and D'Annunzio-Green 2013). Some students experience the university context as an 'alien environment' (Askham 2008), the new demands and the pressure being likely to arouse a variety of emotions. This, in turn, could have an effect on their learning processes, identity development and wellbeing (see e.g., Linnenbrink-Garcia and Pekrun 2011; Pekrun et al. 2011; Trigwell, Ellis and Hahn 2012). Despite the central role that emotions play in different transitions, the focus of research in higher education has tended to be on the cognitive and motivational aspects of learning. The role of emotions in learning was largely neglected in educational research until the 1990s even though neighbouring fields (such as psychology and the neurosciences) had already made strong progress (Govaerts and Gregoire 2008; Mayer, Salovey and Caruso 2004; Pekrun and Linnenbrink-Garcia 2014). In recent decades, however, researchers in education have also begun to acknowledge that emotions can no longer be ignored in studies on successful learning, and that their role in the learning process should be understood more deeply (e.g., Govaerts and Gregoire 2008; Trigwell et al. 2012). Research on learning and emotions has advanced in leaps and bounds in recent years, and their influence on learning and motivation is well acknowledged (Pekrun and Linnenbrink-Garcia 2014). It is therefore somewhat surprising that the' SAL' tradition, one of the main frameworks for studying learning in higher education, has largely ignored the role of students' emotions. The SAL framework focuses on students' approaches to learning (i.e. their intentions and study processes),

and on the relationship between their approaches and their experiences of the teaching-learning environment (e.g., Parpala et al. 2010; Ruohoniemi et al. 2010). Many variables are known to relate to the approaches students adopt, and it could be posited that emotions are included. The present study therefore explores the emotions of individual students and analyses how those who experience specific emotions approach their learning, and how they succeed and progress in their studies.

Classifications of academic emotions

Academic emotions refer to emotions that arise in different kinds of academic settings and are directly linked to academic activities such as studying, learning and instruction (Ainley, Corrigan and Richardson 2005; Goetz, Zirngibl, Pekrun and Hall 2003; Govaerts and Grégoire 2008; Pekrun, Goetz, Titz and Perry 2002; Schutz and Lanehart 2002). A typical classification is based on valence, the emotions being classified as positive or negative (e.g., Pekrun et al. 2002a). As Pekrun et al. (2002b) state, the research has focused mainly on negative emotions (e.g., anxiety) and their impact on learning, whereas positive emotions have received much less attention. The importance of positive emotions has been acknowledged recently, however, especially in the context of positive psychology (Seligman and Csikszentmihalyi 2000). Many studies focus only on the positive-negative dimension (see Linnenbrink-Garcia and Pekrun 2011; Pekrun, Elliot and Maier 2006), or concentrate on a very restricted number of emotions (for a review, see Huang 2006). However, this dichotomous distinction is too rough, and attempts have been made to recognise the plethora of emotions students experience in academic settings (e.g., Linnenbrink-Garcia and Pekrun 2011; Pekrun et al. 2006). There is consensus among researchers currently working in the area that students experience a wide variety of emotions in various academic settings, and that this variation should also be taken into account in research (Pekrun, Goetz, Titz and Perry 2002). On the individual level, negative and

positive emotions may occur simultaneously (Boekaerts 2003). An event may elicit both types of emotions among some students, and purely negative emotions among others. Experiencing only negative emotions restricts performance more than experiencing both negative and positive emotions simultaneously (Boekaerts 2003). This person-oriented approach involving the exploration of individual combinations of emotions is often ignored in the research.

Another classification is based on the level of emotional activation. Both positive and negative emotions may be either activating or deactivating (e.g., Pekrun et al. 2002a; Russell and Feldman Barrett 1999; Watson, Wiese, Vaidya and Tellegen 1999). Previous research provides evidence indicating that these different types of emotions also have varying predictive power in explaining student performance. Some activating negative emotions (such as shame and anxiety) may promote learning (Pekrun et al. 2002a), although in general negative emotions tend to have a negative impact on students' performance and success (Dettmers et al. 2011; Trigwell et al. 2012). Deactivating positive emotions (such as relaxation and relief), on the other hand, may not be beneficial for learning and could lead to the adoption of superficial studying strategies (Pekrun et al. 2002a), although positive emotions in general tend to have a positive impact on learning (Dettmers et al. 2011; Trigwell et al. 2012a). Most researchers agree on the positive-negative dimension of emotions, but not all acknowledge the existence of a general independent activation dimension (Schimmack and Grob 2000; Terraciano, McCrae, Hagemann and Costa 2003).

There has been discussion on the degree to which academic emotions are stable and trait-like affects, or more state-like varying from one context to another (see Forgas 2002; Linnenbrink and Pintrich 2002; Ketonen and Lonka 2012; Trigwell et al. 2012; Rosenberg 1998; Pekrun et al. 2011). According to Pekrun et al. (2011), academic emotions such as habitual test anxiety could be considered trait-like, whereas anxiety experienced immediately before a specific exam could be viewed as an emotional state. They further suggest that emotions typically

experienced in courses over a lengthy period of time would be located between the trait and state ends of the continuum.

Students' approaches to learning and academic success

The concept of the approaches to learning has an intention and a strategy component (Entwistle and Ramsden 1983; Biggs 1987). Students adopting a *deep approach* intend to understand and to construct meaning in the study material or content through adopting learning strategies (e.g., relating ideas or using evidence) that help them to realise their intentions (Marton and Säljö 1997; Entwistle and Ramsden 1983). The *surface approach*, on the other hand, is related to memorising without aiming at understanding, and thereby acquiring fragmented knowledge structures (Marton and Säljö 1976; Entwistle and McCune 2004). A third approach to learning, labelled *organised studying* (previously referred to as the *strategic approach*; Entwistle and Ramsden, 1983) refers to the ability to manage time and effort (Entwistle and McCune 2004). As a concept it is very close to self-regulation, similarly focusing on planning and monitoring.

The approaches to learning appear to be related to students' study success (e.g., Amirali, Huon and Kevin 2004; Román, Cuestas and Fenollar 2008; Watkins 2001), as well as academic progress (Duff 2004; Lindblom-Ylänne and Lonka 1999). The deep approach includes elements that enhance deep-level understanding (Biggs 1979; Entwistle and Ramsden 1983; Lindblom-Ylänne and Lonka 1999; Trigwell and Prosser 1991), and thus relates to high-quality learning outcomes and higher achievement (e.g., Diseth and Martinsen 2003; Trigwell et al., 2012; Watters and Watters 2007), although other studies report a relationship between the surface approach and academic achievement (Lizzio, Wilson and Simons 2002). Thus, there is contradictory evidence concerning the relationship between approaches and academic achievement. One reason

for this may be that course grades do not necessarily reflect the quality of learning outcomes in a reliable manner (e.g., Asikainen, Parpala, Virtanen and Lindblom-Ylänne 2013; Segers, Dochy and Cascallar 2003; Struyven, Dochy and Janssens 2005).

The interplay between academic emotions and cognitive, motivational and self-regulatory aspects of learning

Mega, Ronconi and De Beni (2013) point to the need for the conceptual integration of research on emotions, cognition and motivation. Recent research on emotions in education has focused on the interaction between the cognitive and emotional aspects of learning and how they influence academic achievement (Govaerts and Gregoire 2008; Linnenbrink-Garcia and Pekrun 2011; Pekrun et al. 2011). The control-value theory of academic emotions (Pekrun and Perry 2014) addresses this issue via a framework illustrating how they relate to other achievement-related variables. According to the theory, emotions influence students' cognitive resources, motivation to learn, learning strategies and self-regulation. It therefore seems that these different processes mediate the overall effects of emotions on academic achievement, which in turn is assumed to depend on interactions between these processes and task demands.

According to Pekrun and Perry (2014), emotions have a profound effect on the use of different learning strategies and on the motivation to persist and achieve learning goals. It is also assumed that they facilitate the use of different learning strategies and promote self-regulated learning: for example, It has been found that positive emotions positively affect self-regulation, motivation and learning strategies among university and school students (Linnenbrink 2007; Pekrun et al. 2002a; Pekrun et al. 2011). There are only a few studies focusing on the relationship between

emotions and approaches to learning, despite the evidence from previous research that both of these constructs influence learning. Trigwell et al. (2012) conducted one of the studies, exploring the relationship between university students' approaches to learning and their emotions: they found that the deep approach was related to positive emotions and the surface approach to negative emotions.

A study conducted by Chamorro-Premuzic et al. (2007) touched upon the subject from another perspective, showing that approaches to learning are related to emotional stability as measured by the Big Five personality test: they found that emotionally stable individuals tended to apply more deep than surface approaches. A similar finding was reported in a more recent study showing that neuroticism, which is the opposite of emotional stability, was associated with the surface approach (Donche, De Maeyer, Coertjens, Van Daal, Van Petegem, 2013).

The present study combines the emotional, cognitive, motivational and self-regulatory aspects of learning. The cognitive aspect refers to the information-processing component, whereas the motivational aspect refers to the intention component. The self-regulatory aspect relates to the concept of organised studying.

The Finnish higher-education system

University admission is restricted in Finland, and only a limited number of students are accepted into the system each year. Universities use different selection criteria, which often include an entrance examination and success in the national matriculation examination at the end of upper-secondary school. Aspiring students typically spend a lot of time reading relevant material in preparation for the entrance examination. Because of the demanding nature of these tests, the mean age of students is somewhat higher in Finnish universities than in countries with a policy of

free university entrance. Students may spend several years completing their degrees, and consequently there is lack of reliable information on dropout rates. Because the time allowed to finish university studies is not strictly regulated there is a risk of prolongation. Finnish universities do not charge tuition fees regardless of the level of study and the nationality of the students.

Aims

There is a large body of research in academic contexts exploring specific emotions in a specific setting, such as anxiety in exam situations (e.g., Zeidner 1998). However, students experience a wide range of emotions in different academic settings, and it is therefore necessary to explore emotions more generally in all learning situations (Govaerts and Gregoire 2008; Pekrun et al. 2002a). Moreover, thus far studies addressing academic emotions rely primarily on quantitative measures. The questionnaires that are commonly used focus on specific emotions, ignoring others. The present study adopts a qualitative approach, one advantage of which is that it allows respondents to describe their feelings openly and therefore is able to capture a broad range of emotions. As Creswell and Clark (2007) suggest, expanding the quantitative approach to research on emotions by incorporating qualitative analysis would provide a unique angle that could deepen understanding of the role of emotions in learning.

Furthermore, previous studies on academic emotions have tended to adopt a variable-oriented approach, in other words they have explored how emotions emerge in the data on a general level (through the use of Pekrun et al.'s (2011) Achievement Emotions Questionnaire, for example). A person-oriented approach exploring individual combinations of different emotions has not previously been adopted in the research on emotions in university studying. Such an approach facilitates the identification of sub-groups of students with similar profiles (see Vanthournout 2011).

Exploring how these profiles are related to other variables such as learning outcomes yields information that complements results obtained by means of variable-oriented techniques (Fortunato and Goldblatt 2006). It is feasible to expect some variation in students regarding which emotions they experience: some may experience positive or negative emotions almost exclusively, whereas others might experience both equally. With a view to further enhancing understanding of the role of specific emotions in learning, therefore, emotions are treated in this study as single entities as opposed to groups of positive and negative emotions.

The aims of the study are two-fold, based on the above discussion. The first aim is to analyse the emotions individual students experienced during their first study year by clustering students on the basis of the emotions they describe in an interview. Secondly, the intention is to explore how students in different clusters score on approaches to learning, and how they succeed and progress in their studies. Thus, a mixed-method approach is adopted through the use of interview data, questionnaire data and information on students' study success and academic progress.

Methods

Participants

The participants were 43 students who were enrolled in one of three Bachelor of Arts undergraduate programmes at a large research-intensive university in Finland. The three programmes are very popular and therefore students are typically committed to completing their studies. The mean age of the participants was 24 years, ranging from 20 to 36 years. The majority (77%) were female, which reflects the overall proportion of female students in the three programmes. The data were collected at the beginning of the second study year, but the students

were asked to think about their first-year experiences and study processes when they were interviewed and when they filled in in the questionnaire. Twenty students had progressed slowly in their studies during their first year, having obtained less than 36 credits even though they are expected to earn 50. The remaining 23 had progressed quickly, having exceeded the expected 50 credits and earned more than 67.

Instruments

The data consisted of interviews with students, their responses to the Learn questionnaire (Parpala and Lindblom-Ylänne 2012), and information concerning their study success and their progress. The interviews were voluntary and took place at the beginning of the informants' second study year. The fourth author was the interviewer. The length of the interviews varied from approximately half an hour to an hour, and all of them were transcribed verbatim. They covered three broad themes: evaluation of the first study year, student learning during the first study year, and experiences of the teaching-learning environment, including factors that had enhanced or impeded their studying. The interviewees were not specifically asked about their emotions, the idea being to see what kind of role emotions play when students describe their overall experiences of their first study year. Nevertheless, spontaneous expressions of emotion clearly emerged from the data. It has been suggested that measuring emotions in an indirect way has several benefits. Firstly, students might intentionally describe emotions they do not experience in reality if they are directly asked about emotions (see Jostmann, Koole, van der Wulp and Fockenberg 2005). Secondly, indirect measurement ensures that emotions are captured even if the participants are unaware of these affective states (e.g., Jostmann, Koole, van der Wulp and Fockenberg 2005). Thirdly, it eliminates variation in the labels individuals assign to emotions (Quirin, Kazen and Kuhl 2009).

The Learn questionnaire (Parpala and Lindblom-Ylänne 2012), which measures students' approaches to learning and their experiences of the teaching-learning environment, was sent to the students electronically. It was developed from two inventories: the Approaches to Learning and Studying Inventory (ALSI; Entwistle and McCune 2004) and the Experiences of Teaching and Learning Questionnaire (ETLQ; Entwistle, McCune and Hounsell 2003). The questionnaire has been developed over many years on the basis of extensive statistical analyses as well as student and expert interviews held across the University of Helsinki. The factor structure has been examined in ten different faculties (including the Faculty of Arts) and in different study years. Similar dimensions (deep, surface and organised) have emerged in different study years and in different disciplines (Parpala 2010). The focus in the present study was on the section covering students' approaches to learning, measured on 12 items related to student intentions and study strategies. These 12 items measure the three approaches (the deep approach, the surface approach and organised studying), each with four items. The students were asked to respond to each item on a five-point Likert scale. In the present study the Cronbach's alphas varied between 0.72 and 0.75 for the deep and surface approaches and organised studying, which indicate adequate levels of internal consistency (Nunnally and Bernstein 1994) and are similar with previous studies using the Learn questionnaire (see Parpala and Lindblom-Ylänne, 2012).

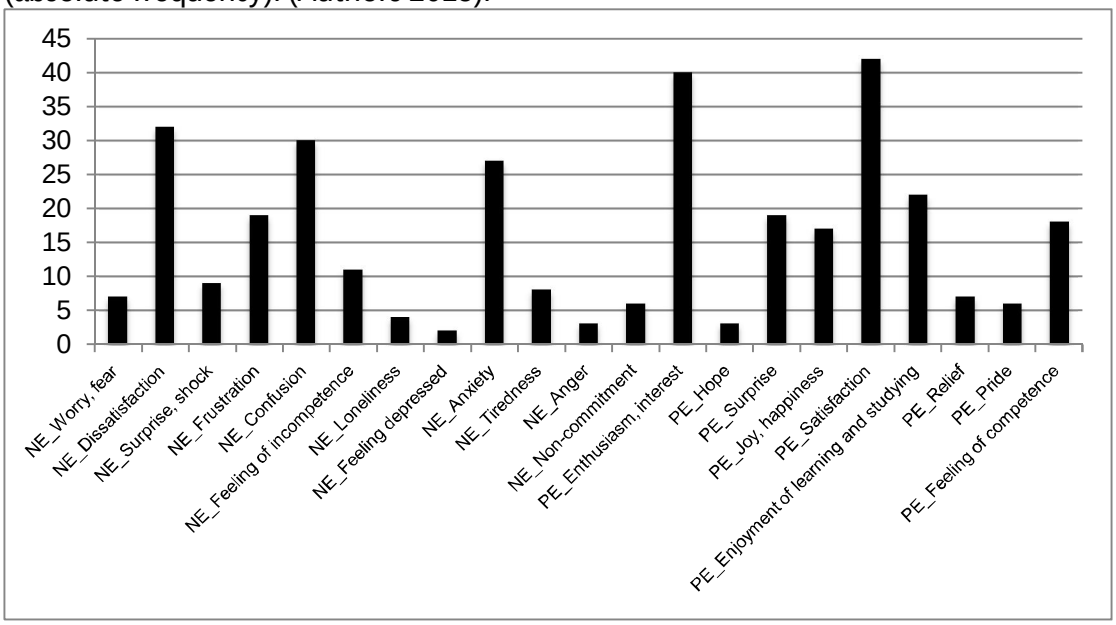
Information on study progress (earned credits) and study success (Grade Point Averages 'GPA') was gathered from the student registry. GPAs were calculated for each student covering the courses they had completed during their first study year. Each course was graded on a six-point scale: '0' referring to fail, '1' to the lowest pass grade and '5' to the highest grade. Failed courses were not included in the GPA because the information received from the student registry only covers completed courses.

Analyses

The interview data were subjected to qualitative content analysis. The results are reported in our other study (Hailikari, Kordts-Freudinger and Postarefff 2016), and were utilised in the present study to analyse the data from a person-oriented perspective. Inductive qualitative content analysis (Elo and Kyngäs 2008; Graneheim and Lundman 2004) was used so as to identify all the descriptions related to emotions. Any related description, whether explicitly (e.g., "I was very frustrated") or metaphorically (e.g., "it's like hanging by a thread all the time") expressed, was included in the analysis, as were feelings of competence and incompetence. Each emotion was coded, in other words given a label (e.g., frustration or satisfaction). The first and the fourth authors did this independently, who then thoroughly discussed all the coded emotions. They agreed on the coding of the emotions in almost all cases, needing further negotiation to reach a common understanding in only a few cases. The preliminary codes were defined and combined several times before the final codes were formed. The first phase of the analysis eventually produced 61 codes. These codes were grouped in two categories during the second phase, based on their valence: a) positive emotions and b) negative emotions. Of the 61 codes, 25 concerned positive and 36 indicated negative emotions. Similar positive emotions were grouped together, resulting in nine broader categories. A similar procedure was followed in the case of negative emotions, resulting in 12 broader categories (a more detailed description of the identified emotions is described in Hailikari, Kordts-Freudinger and Postareff 2016).

The most frequently reported positive emotions were enthusiasm and interest, as well as satisfaction and contentment. Among the negative emotions, dissatisfaction, confusion and anxiety were the most common. Figure 1 shows all the identified emotions and their frequencies.

Figure 1. Frequency of expressions among all the negative (NE) and positive (PE) emotions rated (absolute frequency). (Authors 2015).



The previous study was based on a variable-oriented approach and the results described the range of emotions the students mentioned and the absolute frequency, but did not identify the emotions that individual students described. The data were reanalysed in the present study from a person-oriented perspective to allow exploration on a more individual level. The unit of analysis was one student, and the first, third and fourth authors checked which emotions this student described in the interview. Emotions were quantified such that each one was coded as a dummy variable for each student in the SPSS. If the student had mentioned a specific emotion (once or more often) it was coded '1', and if not it was given the code '0'.

This coding was applied in a hierarchical cluster analysis (HCA) using R (R Core Team 2014) to group students expressing similar emotions. Hierarchical clustering was chosen as the analytical method on both methodological and substantive grounds. There were two main methodological reasons for the choice: first, the modest sample size (N = 43), and second, the fact that using HCA allowed us to apply a distance measure (namely, the matching coefficient) that is suitable for dichotomous data. On the substantive level, given that we expected the phenomenon

under investigation to be hierarchical in nature HCA was a natural choice of method. Specifically, we expected students experiencing positive emotions and not experiencing negative emotions to be grouped in one broad main cluster, and vice versa for another main cluster. These broad clusters would then comprise students experiencing more specific combinations of positive and negative emotions as sub-clusters. In this sense, we saw HCA as a natural analytical method for this type of data. For an overview of different types of cluster analysis and guidelines on their use, see Jain, Murty and Flynn (1999).

Given the nature of the data, the simple matching coefficient distance metric seemed suitable: both joint presences and joint absences of experiencing an emotion are considered when the distance between two students or student clusters is calculated. We considered this a theoretically sound choice in the present study in the belief that both the lack of and the experiencing of certain emotions were similarly indicative of "emotional similarity" among students. For further details concerning the simple matching coefficient, and for a survey of similarity measures for binary data, see Choi, Cha and Tappert (2010).

Variable selection is a thorny issue in cluster analysis, and there are many options when the data is continuous in nature (for a comparison of eight different options, see Steinley and Brusco 2008). There are also various elegant regularisation-based approaches (Witten and Tibshirani 2010). Fewer options are available for binary data, but some interesting model-based alternatives have recently been developed (Wang and Kabán 2005; Dean and Raftery 2010). However, we did not consider model-based methods such as latent-class analysis a feasible option given our small sample size, and rather adopted a two-stage procedure for excluding variables from the cluster analysis. First, we excluded variables with almost constant values for all observations (i.e. almost all students either had experienced the emotion or almost none had). This step led to the exclusion of six variables. In the second step we conducted a series of hierarchical cluster

analyses, dropping one variable at a time based on the application of Fisher's exact tests to all the variables included in the analysis for cluster solutions involving two to five clusters. Specifically, during each iteration, we excluded the variable with the distribution that was most similar among the different clusters, in other words the one that did not differentiate the clusters.

When combining clusters of observations, the complete-linkage (farthest neighbor) criterion was used. The number of clusters was chosen based on average silhouette widths and silhouette plots (Rousseeuw 1987), the predictive validity of the clustering variables and the interpretability of the cluster solutions.

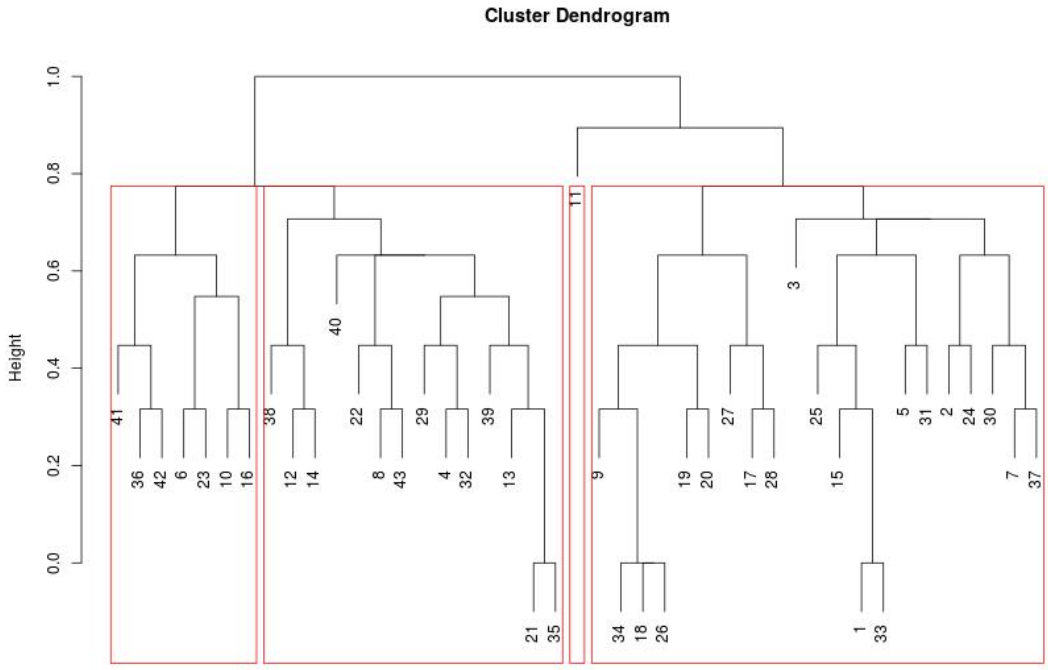
Following the cluster analysis, analysis of variance (ANOVA) was used to find out how the students in each cluster scored on approaches to learning, and how they progressed and succeeded in their studies. The cluster sizes were unequal and for this reason it was necessary to account for possible heteroscedasticity when the ANOVAs were calculated. Given the low power of tests of heteroscedasticity to detect deviations from homoscedasticity in small samples, it has been recommended not to use them when the sample size is small (Long and Ervin 2000), and rather to make routine corrections (ibid.) We heeded this advice and applied the HC3 correction (ibid.) to the p-values of the ANOVA. We also carried out the Kruskal-Wallis test as an additional check of differences among the clusters because of their smallish sizes. We report Cohen's d-values as effect sizes for the differences in the mean values of the clusters. Finally, t-tests were conducted as a post-hoc comparison among the cluster means. The variances of the dependent variables were assumed unequal in the different clusters. Holm correction was used for the p-values.

Results

Student clusters

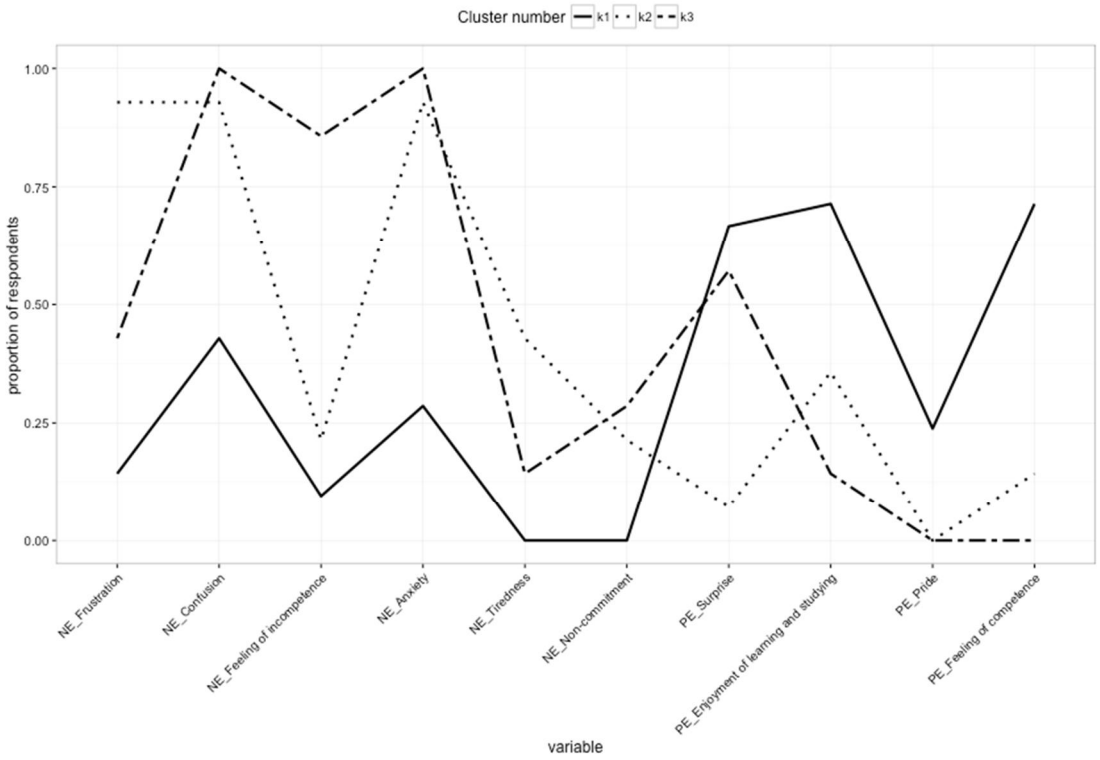
Hierarchical cluster analysis was used to group students based on the patterns of emotions they expressed. The results are shown as a dendrogram in Figure 2. The mean silhouette value was highest for the two-cluster solution (0.23), whereas it was lower for the four-cluster solution at 0.15, mainly because of observations with low negative silhouette values, indicating possible misclassification. We did not attempt to improve the cluster structure by manually moving these observations to other clusters, however, because that would have lowered the silhouette values of other observations to below zero. One of the observations formed a singleton cluster, which was discarded from further analysis, resulting finally in three clusters. This three-cluster solution was chosen over the two-cluster solution on substantive grounds: the first cluster comprised students experiencing mostly positive emotions and fewer negative emotions, and vice versa for the second cluster. The three-cluster solution also revealed more interesting combinations of emotions and was thus considered to capture the combinations in a more detailed manner. Moreover, it was useful in explaining the variation in approaches to learning, study success and study progress. The boxes in Figure 2 illustrate the identified clusters.

Figure 2. Cluster dendrogram.



The 21 students belonging to the largest cluster were the ones describing the most positive and the fewest negative emotions (see Figure 3). This cluster is referred to later as Cluster 1. Most of all, they experienced feelings of competence and enjoyment of learning, and none of them described non-commitment or tiredness. Cluster 2 comprised 14 students. Most of their descriptions implied anxiety, confusion and frustration, but they did not describe feelings of incompetence. They described considerably fewer positive than negative emotions. The seven students in Cluster 3 were similar to those in Cluster 2 in that they described more negative than positive emotions, but dissimilar in also describing feelings of incompetence. Furthermore, all the students in Cluster 3 experienced confusion and anxiety.

Figure 3. Negative and positive emotions described in the three clusters.



Approaches to learning, study success and study progress in the three clusters

We investigated the levels of the students' approaches to learning, study success and study progress (see Table 1) within the three emotion clusters. The differences between the clusters were statistically significant for the deep [$F(2, 39) = 11.38$, $p<.001$] and the surface [$F(2, 39) = 4.32$, $p=.02$] approaches to learning, study success [$F(2, 38) = 9.09$, $p<.001$] and study progress [$F(2, 39) = 3.34$, $p=.046$]. The Kruskall-Wallis test also showed statistically significant differences between the clusters in the deep and surface approaches and study progress, but did not quite reach a significant level ($p=.055$) with regard to study success.

	Cluster 1 (*n*=21) *M* (*SD*)	Cluster 2 (*n*=14) *M* (*SD*)	Cluster 3 (*n*=7) *M* (*SD*)

Deep approach**	3.7 (.61)	4.1 (.39)	3.4 (.28)
Surface approach**	2.1 (.65)	2.2 (.64)	2.9 (.57)
Organised studying	3.5 (.68)	3.2 (.89)	2.7 (.71)
Study success (GPA)**	3.7 (.71)	3.7 (.61)	3.1 (.11)
Study progress (credits per year) **	58 (18.9)	60 (27.2)	39 (16.6)

Table 1. Mean of approaches to learning, study success and study progress in each cluster.

Post hoc tests were carried out by means of t-tests with Holm correction, assuming unequal variance in the clusters. The p-values for the comparisons and associated Cohen's d values were as follows. Students in Cluster 2 achieved significantly higher scores on the deep approach to learning than those in Clusters 1 (p = .031, d = 0.80) and 3 (p < .001, d = 2.09), whereas those in Cluster 3 achieved significantly higher scores on the surface approach than those in Clusters 1 (p = .031, d = 1.25) and 2 (p = .044, d = 1.15). Although the main effect for study progress was statistically significant, the group comparisons did not reach a significant level. In terms of study success, the students in Cluster 3 achieved significantly lower scores than those in Clusters 1 (p = .007, d = 0.87) and 2 (p = .015, d = 0.99).

Information on the students' approaches to learning, study success and study progress was combined in each cluster. Cluster 1 was labelled *Quickly progressing successful students experiencing positive emotions:* in particular, they described enjoying studying at the university. These students also described feelings of competence. The deep-approach score was rather high and the surface-approach score was the lowest of all the clusters. The score for organised studying was the highest of the three clusters, even though the differences were not statistically significant. Students in this profile succeeded well in their studies with a mean GPA of 3.7, 5.0 being the

maximum. They also progressed quickly in their studying, earning 58 credits during their first study year against the expected 50 credits.

Cluster 2 was named *'Quickly progressing successful students experiencing negative emotions.'* These 14 students typically described frustration, confusion and anxiety, although feelings of incompetence were not typical of them. Their deep-approach scores were the highest and their surface-approach scores were low. They succeeded as well as the students in Cluster 1 and made the quickest progress, earning 60 credits during their first study year.

The third cluster was labelled '*Slowly progressing students experiencing negative emotions'.* The seven students in this cluster described being confused and anxious. They also experienced lots of feelings of incompetence, which was not characteristic of the students in the other clusters. They achieved the lowest scores on the deep-approach and the highest on the surface-approach scale. Their study-success score was the lowest among the three clusters, the GPA being 3.1, and they progressed considerably more slowly than the students in the other clusters. They earned only 39 credits during their first study year, and thus did not achieve the required 50 credits.

Discussion

The results showed that emotions have a central role in student learning during the transition to university. The person-oriented perspective and the mixing of qualitative and quantitative approaches gave new insights into the combinations of emotions individual students experience. The hierarchical cluster analyses facilitated the formation of three profiles, which differed in terms of expressed emotions. The students in all three clusters described both positive and negative emotions, but varied in the extent to which they described them. The findings also revealed how

combinations of emotions are intertwined with approaches to learning, study success and study progress.

Most of the emotions described by those in the first cluster were positive, and the students experienced feelings of competence. They also described negative emotions, but considerably fewer than the students in the other clusters. They scored rather highly on the deep approach to learning, which is in line with previous research showing a relationship between positive emotions and this approach (Trigwell et al., 2012). The students in the first cluster also succeeded well and progressed quickly in their studies, seemingly smoothly without major difficulties: Dettmers et al. (2011) and Trigwell et al. (2012) report similar findings that positive emotions correlate with good academic success. These students also seemed actively to apply an 'optimistic task-focused cognitive strategy' to cope with the challenges in their studies (Eronen, Nurmi and Salmela-Aro 1998; Heikkilä, Lonka, Nieminen and Niemivirta, 2012). It has been found that students who adopt an optimistic strategy strive for success, feel in control of their own outcomes, and set high expectations that are in line with their perceptions of themselves (Norem 2001). The students in Cluster 1 were similar to students with an emotionally stable personality, which has been associated with the adoption of the deep approach to learning as well as to higher levels of confidence (see Chamorro-Premuzic et al., 2007; Donche et al., 2013).

The results concerning Cluster 2 were interesting because although the students tended to experience the strong negative emotions of anxiety and frustration, they made the fastest progress in their studies and succeeded as well as the students in Cluster 1. This could be attributable to the activation of emotions: frustration and anxiety are categorised as negative emotions, but despite the negative tone they may well be activating and beneficial for learning (e.g., Pekrun et al. 2002b). Students in this cluster achieved the highest scores on the deep approach to learning, which indicates that they had effective study strategies. No relationship between negative

emotions and the deep approach was identified in a previous study exploring the relations between approaches and emotions (Trigwell et al., 2012). The students in our study could have adopted the 'defensive-pessimistic' cognitive strategy given that they typically struggled in their studies but still succeeded well (Martin, Marsh and Debus 2003). Defensive pessimism involves thinking through all the things that might go wrong (Norem and Cantor 1986), thus defensive expectations and reflectivity help defensive pessimists to regulate their anxiety and enhance their cognitive and affective control (Norem and Illingworth 1993).

The students in Cluster 3 experienced mainly negative emotions, achieving the lowest scores on the deep-approach scale and the highest on the surface-approach scale. Trigwell and colleagues (2012) also identified a relationship between negative emotions and the surface approach to learning. A sense of incompetence was typical among the students in Cluster 3, but was not common in the other clusters. Bandura (1982) also found a relationship between negative emotions and a sense of incompetence indicating that self-efficacy belief, which is similar to a sense of competence, influences emotional arousal. The students in Cluster 3 experienced even more confusion and anxiety than those in Cluster 2. Moreover, their progress was dramatically slower and their GPA was much lower compared with those in the other clusters. Previous research has similarly shown a relationship between negative emotions and lower levels of academic success (Dettmers et al. 2011; Trigwell et al. 2012). However, the results of the present study indicate that the relationship between emotions and study success is not clear in that the students in Cluster 2 succeeded well despite describing mainly negative emotions. A sense of incompetence seems to have a huge impact on success and progress, and was the aspect that most clearly differentiated the students in Clusters 3 and 2. Those in Cluster 3 revealed characteristics that are typical of a neurotic personality and thus could lack emotional stability. Previous research has shown that neurotic students are more likely to have lower levels of confidence in their ability to perform well

in their studies, are likely to worry about the outcomes of exams, and are more likely to adopt the surface than the deep approach to learning because their worries might hinder them (Chamorro-Premuzic at al., 2007).

It is not possible to draw conclusions on the directions of the relationships linking emotions, approaches to learning and study success and progress on the basis of the results of the present study. It may be that difficulties with study strategies cause negative emotions, and that poor success in exams result in negative emotions. According to the control-value theory of academic emotions (Pekrun and Perry 2014), the emotions students experience have an impact on their choice of study strategies, and thus also on study success. Bandura (1982) suggests that self-efficacy beliefs influence emotional arousal. Thus, in the light of Pekrun and Perry's (2014) model and Bandura's (1982) insights it could be argued that a sense of competence or incompetence (i.e. self-efficacy beliefs) influences the emergence of specific emotions, which in turn affects the type of learning strategies adopted and, finally, outcomes in the form of study success and progress. Similarly, according to Wigfield and Eccles's (2000) expectancy-value theory, an individual's expectations of success (a concept that is very similar to self-efficacy belief) and the extent to which he or she values the activity could explain performance and persistence. Thus, the sense of incompetence experienced by the students in Cluster 3 could plausibly explain their lower performance levels and negative emotions, whereas the sense of competence experienced by the other students (especially in Cluster 1) is a possible explanation of their better performance.

The present study naturally had its limitations. The small number of observations made it difficult to evaluate the stability of the cluster structure that we obtained. For instance, it was not feasible to carry out cross-validation analyses using different halving methods due to the small size of the sample. Thus, the present results should be treated as tentative until they can be replicated with an independent sample.

Another limitation is that the interviews in which the interviewees reflected on their first-year experiences were conducted at the beginning of their second study year, hence there may have been memory distortion (see e.g., Cox & Hassard, 2007; Levine, Lench & Safer, 2009). It would be useful in the future to consider the application of real-time techniques to capture students' emotions more effectively.

We were not able to take frequency into account in the study: an emotion was coded number one regardless of whether the student mentioned that specific emotion once or several times. There is thus a need in future studies to focus attention on the frequency and intensity of expressed emotions.

Furthermore, the ratio of variables on which the clustering was based was rather high in the present sample in relation to the number of observations, although the original number of emotions identified through the qualitative analysis was reduced. Even if the three-cluster structure we obtained reflected a genuine grouping on the population level, many potential combinations of the emotion variables remain unobserved in a sample of this size. This is a further reason to replicate the present study with a much larger sample of students. Despite these limitations, however, the study enhances understanding of student emotions and how they relate to learning approaches, study success and study progress during the transition to university.

In terms of practical implications, we suggest that first-year students should be encouraged to maintain the positive emotions they experience during the transition phase through the creation of safe and supportive environments. Around half of our student sample belonged to Cluster 1, which could be considered to represent a desired combination of emotions, study success and study progress. Although the students in Cluster 2 succeeded well and progressed quickly, they had experienced a great amount of frustration, confusion and anxiety during their first year, which will, in the long run, have a negative impact on their wellbeing. As Niculescu et al. (2015, p. 15) note

in their recent paper: “Good education should also care about how students feel and not only how well they can perform academically”. They also point out that education should foster students’ sense of competence, which the results of the present study support: the students in Cluster 3 who experienced a sense of incompetence the most strongly achieved rather limited success and progressed slowly. The self-determination theory also highlights a sense of competence as one of the key elements, along with autonomy and social relatedness that facilitate intrinsic motivation and wellbeing (Ryan and Deci 2000).

Future exploration of emotions should focus on longitudinal research to enhance understanding of how stable and trait-like first-year students’ emotions are, and of the extent to which students experiencing strong negative emotions are able to regulate and change them over time. It would also be highly relevant to find ways of supporting students’ sense of competence during their first study year. Particular attention should be given to students at risk, and to the kind of learning environments that best support their successful studying at the university. For example, the degree of autonomy in the teaching-learning environment could have interesting effects on students’ emotions and sense of competence.

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